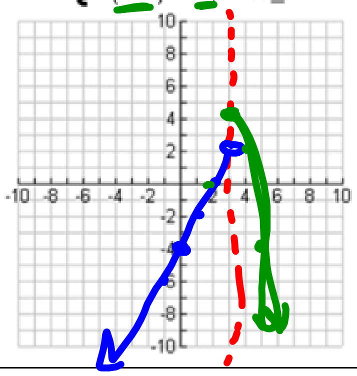
Bell Ringer

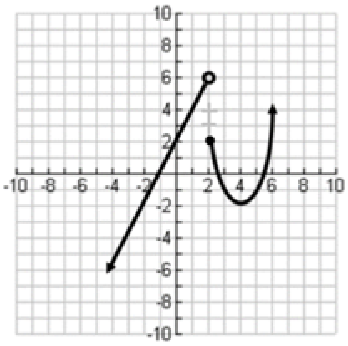
Wednesday 5/1

1. Graph the piecewise function.

$$f(x) = \begin{cases} 2x - 4 & x < 3 \\ -2(x-3)^2 + 4 & x \geq 3 \end{cases}$$



2. Write a piecewise function for the graph below and state their domains.



$f(x) = \{$

Correct 14.1

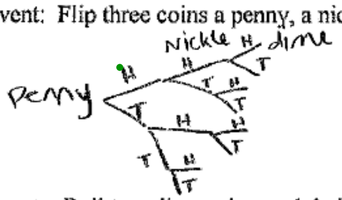
Name: _______________ Hr:____

Sec. 14.1

Sample Space and Simple Probability

State the sample space for each of the following events. Remember the sample space is a list of all possible outcomes for the event. Please try and use either an area model or a tree diagram to help construct the sample space. Please explain why you chose the method used.

1) Event: Flip three coins a penny, a nickel, and a dime



HHH
HHT
HTH
HTT
THH
THT
TTH
TTT

or

penny

nickel	H	T
H	HH	HT
T	TH	TT

dime

nickel and penny	H	T
HH	HHH	HHT
HT	HTH	HTT
TH	THH	THT
TT	TTH	TTT

2) Event: Roll two dice and record their sum.

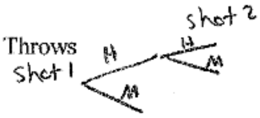
dice 2

dice 1	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

3) Event: Shooting One – and – One Free Throws

H = Hit the shot

M = miss the shot



HH
HM
M

4) Use question #1 to answer the following, find the probability of each of the following events occurring. Be sure to show your thinking clearly:

3 H
2 H 1 T
2 T 1 H
3 T

a) Three heads $\frac{1}{8}$

b) At least two heads $\frac{4}{8} = \frac{1}{2}$

c) One head and two tails $\frac{3}{8}$

d) At least one tail $\frac{7}{8}$

e) Exactly two tails $\frac{3}{8}$

f) At least one head and one tail $\frac{6}{8} = \frac{3}{4}$

g) Which is more likely, flipping at least 2 heads or a least 2 tails? Explain

2 heads $= \frac{4}{8}$ 2 tails $= \frac{4}{8}$

they are the same

f) Did you choose the best method to represent this sample space? Explain

Both work well

5. Use question #2 to answer the following.
   a) In a standard casino dice game the roller wins on the first roll if he rolls a sum of 7 or 11. What is the probability of winning on the first roll?

   $\frac{8}{36} = \frac{2}{9}$

   b) The player loses on the first roll if he rolls a sum of 2, 3, or 12. What is the probability of losing on the first roll?

   $\frac{4}{36} = \frac{1}{9}$

   c) If the player rolls any other sum, he continues to roll the dice until the first sum he rolled comes up again or until he rolls a 7, whichever happens first. What is the probability that the game continues after the first roll?

   Prob. of not $\frac{12}{36}$ or $\frac{24}{36} = \boxed{\frac{2}{3}}$

   $1 - \frac{12}{36}$

6. Still using question #2, in a different game of dice, you win if you roll a sum of six, lose if you roll a sum of seven. If anything else happens you ignore the results and roll again.
   a) How many ways are there to get a sum of six?

   5

   b) How many ways are there to get a sum of seven?

   6

   c) How many possible outcomes are important in this problem?

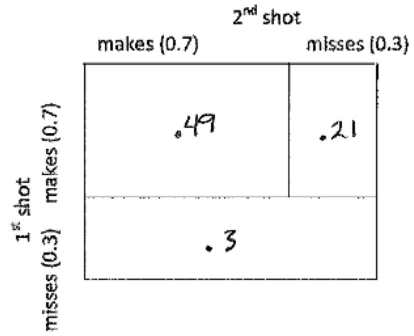
   11, the outcoms where you win or lose

7. Rimshot McGee has a 70% free throw average. The opposing team is ahead by one point. Rimshot is at the foul line in a one-and-one situation with just seconds left in the game. (A one-and-one situation means that the player shoots a free throw. (If he makes the shot, he is allowed to shoot another. If he misses the shot, he gets no second shot. Each shot made is worth one point.)

a) Take a guess. What do you think is the most likely outcome for Rimshot (use the sample space from question #3 to help if necessary)?

He will most likely make both shots

b) Jeremy is working on the problem with Jenna and he remembers that area models are sometimes useful for solving problems related to probability. They set up the following area modes. Which part of the model represents Rimshot getting one point? How can you use the model to help you calculate the probability that Rimshot will get exactly one point?



c) Use a model to find the probability of each outcome (0 points, 1 point, 2 points). What is the most likely of the three outcomes?

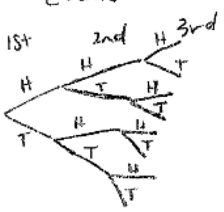
0 points .3 or 30%

1 points .21 or 21%

2 points .49 or 49%

8. Eddie told Alfred, "*I'll bet if I flip three coins I can get exactly two heads.*" Alfred replied, "*I'll bet I can get exactly two heads if I flip four coins!*" Eddie scoffed. "*Well, so what? That's easier.*" Alfred argues, "*No, it's not. It's harder.*" Who is correct? Show all of your work and be prepared to defend your conclusion.

Eddie (3 coins)



8 outcomes

Exactly 2 Heads
HHT, HTH, THH

$\boxed{\frac{3}{8}}$

They are the same

Alfred

$2 \cdot 2 \cdot 2 \cdot 2 = 16$ outcomes

Exactly 2 Heads
HTHT, HTTH, THHT
THTH, TTHH, HHTT

$\frac{6}{16} = \boxed{\frac{3}{8}}$

9. Harold sorted his jellybeans into two jars. He likes purple ones best and the black ones next best, so these are both in one jar. His next favorites are yellow, orange, and white, and these are in another jar. He throws all the rest in the garbage. Harold allows himself to eat only one jellybean from each jar per day. He wears a blindfold when he selects his jellybeans so he cannot choose his favorite first. What is the probability that Harold gets one black jellybean and one orange jellybean, if the first jar has 60% black and 40% purple jellybeans and the second jar has 30% yellow, 50% orange, and 20% white jellybeans?

B P Y O W
60% 40% 30% 50% 20%

$(.6)(.5) = .30$

10. What is the probability that $x^2 + 7x + k$ is factorable if $0 \le k \le 20$ and k is an integer?

k
$1 \cdot 6 = 6$
$6 \cdot 1 = 6$
$2 \cdot 5 = 10$
$5 \cdot 2 = 10$
$3 \cdot 4 = 12$
$4 \cdot 3 = 12$

21 outcomes factorable if k = 0, 6, 10, 12

$\frac{4}{21}$

11. A coin is flipped. Find the probability of heads (P(H) *means the probability of a Head is*)?

$\frac{1}{2}$

12. A die is rolled. What is P(2)? What is the probability of an odd number? P(Prime)?

$P(2) = \frac{1}{6}$ $P(\text{odd}) = \frac{1}{2}$ $P(\text{Prime}) = \frac{1}{2}$

13. A card is drawn from a standard deck of playing cards. (4 suits – black clubs, black spades, red diamonds, red hearts; 13 of each suit, Ace (A), numbers 2 thru 10, Face Cards – Jack (J), Queen (Q), King (K); 52 cards in all). Find the following probabilities.

a) P(2)

$\frac{4}{52} = \frac{1}{13}$

b) P(red)

$\frac{1}{2}$

c) P(K)

$\frac{4}{52} = \frac{1}{13}$

d) P(club)

$\frac{13}{52} = \frac{1}{4}$

d) P(face card)

$\frac{12}{52} = \frac{3}{13}$

e) P(black face card)

$\frac{6}{52} = \frac{3}{26}$

due tomorrow - questions?

14.2– Probabilities of Unions and Intersections

Describing Subsets Name: ______________________

Ready Hour: ________

Find the probability of the following events.

1. Avery has been learning to play some new card games and is curious about the probabilities of being dealt different cars from a standard 52 – card deck. Help him figure out the probabilities listed below:
   a. P(king)
   b. P(queen)
   c. P(diamond)
   d. P(black)
   e. P(face card)
   f. P(three or four)

2. Assume that two standard dice are being rolled and the sum is being calculated.
   a. P(sum 2)
   b. P(sum of 9)
   c. Event A = {the sum is a multiple of 3}, find P(A)
   d. Event B = {the sum is a multiple of 4}, find P(B)

Set

3. Using the situation described in problem #1 answer the following:
   a. What is P(king or diamond)? How does your answer relate to the probabilities you calculated in problem #1?
   b. What is the P(king or queen)? Again, how does your answer relate to the probabilities you calculated in problem #1?
   c. P(diamond or face card)
   d. P(10 or black)
   e. P(8 and red)
   f. P(less than 5)
   g. P(less than 3 or face card)
   h. P(greater than 5 but less than 10)

4. Using the situation described in problem #2 find the following.
   a. What is P(A and B)?
   b. What is P(A or B)?

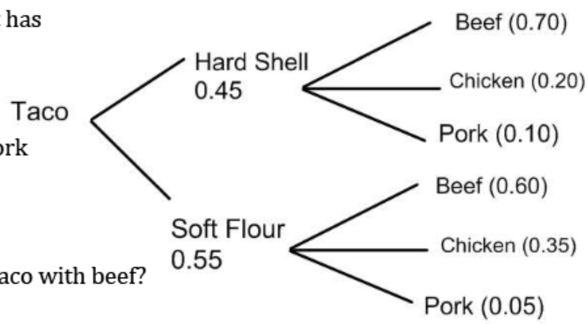
5. In a random sample of 10,000 college students, a research comply found that 35.7% were involved in a club and 27.8% studied 4 or more hours per day. When they reported their findings, the research company indicated that 53.4% of college students were either involved in a club or they studied 4 or more hours per day. Given this information, what is the probability that a college student is involved in a club and studies 4 or more hours per day?

Go!

6. Eddie is arguing with Tana about the probability of flipping three coins. They decide to flip a penny, nickel and a dime. If they flip three coins, would a tree diagram or an area model be better for determining the sample space? Justify your answer.

7. Zelda, the fortune teller at the fair, foresees you meeting a tall dark stranger in the next 140 days. What is the portability that you will meet the stranger on Monday? What is the probability that you will meet the stranger on the weekend? What is the probability you will meet the stranger on a weekday?

Use the tree diagram to answer 8-11



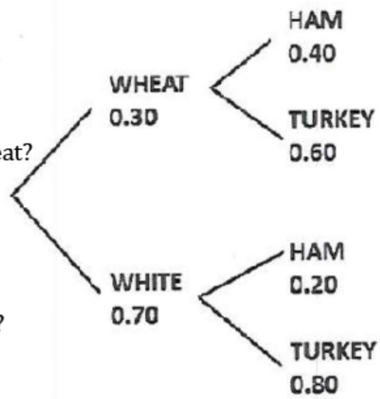
8. What is the probability that you order a taco that has a hard shell with chicken?

9. What is the probability of ordering a taco with pork as the meat?

10. What is the probability of ordering a soft flour taco with beef?

11. What is the probability of ordering a hard shell taco?

Use the tree diagram to answer 12-15



12. What is the probability that you order a sandwich on white bread?

13. What is the probability of ordering a sandwich with turkey on wheat?

14. What is the probability of ordering a sandwich with ham?

15. What is the probability of ordering a sandwich with ham on white?

Quick Review...

$$P(A \underset{\text{or}}{\cup} B) = \underline{P(A)} + \underline{P(B)} - P(A \underset{\text{and}}{\cap} B)$$

P(9 ∪ Diamond) =

$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52}$

P(Face card ∪ Black) =

$\frac{12}{52} + \frac{26}{52} - \frac{6}{52} = \frac{32}{52}$

3 pink
2 yellow
1 black

$P(P \cup Y)$

$P(B \cup P)$ $\frac{3}{6} + \frac{2}{6}$ $\frac{5}{6}$

$\frac{4}{6}$

Name: ______________________________Hr:____

14.3 Guided Notes: Compound Probability

Compound probability means finding the probability where 2 or more events occur.

If the outcome of one event **does not** affect the outcome of the other, they are independent.

If the outcome of one event **does** affect the outcome of the other, they are dependent.

and then

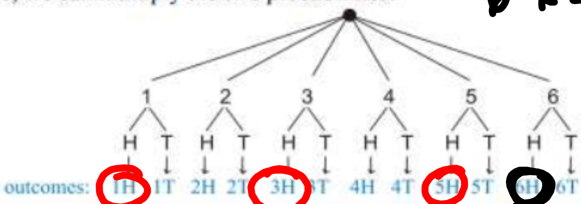
Example 1. You toss a coin, and then you roll a die. What is the probability of getting 6 and heads?

P(6) is 1/6, and P(heads) is 1/2. Clearly, whether you get heads or tails on the coin does not affect what you get on the roll. The two events are *independent*. Therefore, we can multiply the two probabilities.

$6 \times 2 = 12$

P(6 and heads) = $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$

You can also see this probability by looking at the tree diagram, because in only one outcome out of the twelve possible ones do we have 6 and heads.



12 outcomes

P(2, tails) =

$\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$

P(odd number, heads) =

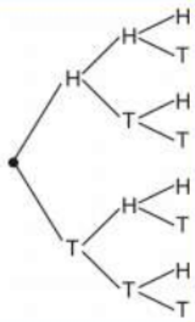
$\frac{3}{6} \cdot \frac{1}{2} = \frac{3}{12} = \frac{1}{4}$

Example 2. You toss a coin three times. What is the probability of getting heads every time?

These three events—toss a coin, toss a coin, toss a coin— are independent. Getting heads on one toss doesn't affect whether you get heads or tails on the next.

P(heads) = 1/2. Therefore, P(heads and heads and heads) = $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

You can also see this from the tree diagram. There is only one outcome with "HHH", and a total of 8 possible outcomes.



P(tails, tails, heads) =

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$

P(heads, tails, heads) =

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$

To find the probability of two or more events occurring, multiply the individual probability of each event.

14.3 With and Without Replacement Task – Stations

Station #1: Materials: 1 spinner, 1 six-sided die.

1. You spin the spinner once and then roll the die once. Find the following probabilities:

P(blue, 5) = P(yellow, even) = P(red, less than 5) =

2. You spin the spinner twice, then roll the die once. Find the following probabilities:

P(blue, blue, 1) = P(yellow, red, odd number) = P(blue, red, at least 2) =

3. You roll the die twice, then spin the spinner once. Find the following probabilities:

P(2, 3, blue) = P(odd, even, red) = P(6, at least 4, yellow) =

4. Are the events in 1-3 independent or dependent? Explain.

Station #2: Materials: red, white and blue marbles.

1. How many marbles are there of each color? What is the total number of marbles?

red - 5 blue - 3 10 marbles
white - 2

2. Calculate the probability of choosing one red marble, then **set that marble aside.**

$\frac{5}{10} = \frac{1}{2} = 50\%$

3. Now that the red marble has been chosen and set aside, how many total marbles are left?

9 marbles

4. What is the probability of choosing a red marble now that the first red marble has not been replaced? (hint: what is the number of red marbles and total marbles now?)

$\frac{4}{9}$

5. Did the probability of choosing the second red marble change once one red marble had already been taken? (Compare #2 and #4). If so, why do you think this is happening?

Yes! # marbles is changing

6. What if the first red marble had been replaced (put back) and not set aside. What would the probability have been to choose a second red marble?

$\frac{5}{10}$

7. P(red, red) **without** replacement = P(red, red) **with** replacement =

$\frac{5}{10} \cdot \frac{4}{9} = \frac{20}{90} = \frac{2}{9}$ $\frac{5}{10} \cdot \frac{5}{10} = \frac{25}{100} = \frac{1}{4}$

Station #3: Materials: black white and pink cubes.

1. You choose one cube, then put it back and choose one more cube. Find the following probabilities:

P(black, white) = P(pink, pink) = P(white, not pink) =

2. You choose one cube at a time until you have chosen **three** cubes. After each cube is chosen, it is put back in the pile to possibly be chosen again. Find the following probabilities:

P(white, white, white) = P(pink, black, white) = P(not pink, white, not white) =

3. You choose one cube at a time until you have chosen **four** cubes. After each cube is chosen, it is put back in the pile to possibly be chosen again. Find the following probabilities:

P(black, black, black, black) = P(white, pink, not white, not pink) =

4. Are the events in 1-3 independent or dependent? Explain

Station #4: Materials: brown, orange and purple cubes

1. You choose one cube. Without putting it back, you choose one more cube. Find the following probabilities:

P(brown, orange) = P(purple, purple) = P(orange, not orange) =

2. You choose one cube at a time until you have chosen **three** cubes. After each cube is chosen, it is set aside, not to be chosen again. Find the following probabilities:

P(purple, brown, orange) = P(brown, brown, purple) = P(now brown, not purple, orange) =

3. You choose one cube at a time until you have chosen **four** cubes. After each cube is chosen, it is set aside, not to be chosen again. Find the following probabilities:

P(purple, purple, orange, orange) = P(brown, purple, brown, not orange) =

4. Are the events in 1-3 independent or dependent? Explain

Station #5: Materials: Deck of Cards

1. You choose one card. Without putting it back, you choose one more card. Find the following probabilities:

a. P(7, queen) =

b. P(king, king) =

c. P(king of hearts, 3) =

d. P(jack of diamonds, not a jack)=

e. P(heart, 2 of clubs)=

2. You choose one card. You put the card back in the deck and choose another card. Find the following probabilities:

a. P(club, queen) =

P(3,3) =

P(8, jack of spaids) =

P(jack of diamonds, not a jack)=

P(king, 9 of hearts)=

3. From the 2 problems in this station, which one is independent?

Station #6: Materials: Yellow and Red Chips

1. You flip the chip three times (like flipping a coin). Find the following probabilities:

a. P(yellow, red, yellow) =

b. P(yellow on the second toss) =

c. Create a tree diagram to show the sample space.

d. What is the probability of getting yellow twice and red once?

due Friday 1-20 odds, 21-25

Name:_______________________Hour_____ **14.3 - Probability With and Without Replacement**

You have a jar of gumballs: 4 red, 9 green, 8 blue, 6 yellow, and 3 white. One gumball is drawn randomly. Find the following probabilities and write as a reduced fraction and as a percent.

1. P(white)
2. P(green)
3. P(blue $\cup$ yellow)
4. P(complement of red)

You roll a 6 sided die one time. Find the following probabilities. Write as a reduced fraction and as a percent.

5. P(7)
6. P(1 $\cup$ 2)
7. P(odd number)
8. P(complement of 6)

In your math class there are whiteboard markers at the board: 2 green, 2 blue, 2 red, 1 purple, and 1 black. One student randomly chooses a marker and then replaces it. The second student then chooses a marker. What is the probability of the student randomly choosing the colors listed below? Write the probability as a reduced fraction and percent.

9. P(green, blue)
10. P(red, purple)
11. P(black, black)
12. P(purple, green)

In your sock drawer you have 10 pairs of white socks, 4 pairs of black, and 2 pairs of brown. You randomly choose a pair of socks each day. Sometimes you don't replace them because they are dirty. You choose another pair of socks the next day. Find the probability of the following situations. Write the probability as a reduced fraction and a percent.

13. P(white, white) **with replacement**
14. P(white, black) **without replacement**
15. P(black, brown) **without replacement**
16. P(brown, brown) **without replacement**
17. P(white, white, white) **with replacement**
18. P(white, black, brown) **with replacement**
19. P(black, white, white) **without replacement**
20. P(brown, brown, brown) **with replacement**

Determine if the following events are dependent or independent. Then calculate the probability of each.

21. Selecting a glazed donut from an assortment of twelve donuts, 4 glazed, 4 with sprinkles, 4 maple bars, and 4 cake donuts. Then eating it, and then selecting a maple bar from the same box.

22. Given a bag of marbles with 2 red, 3 green and 2 blue. What is the probability of choosing a red marble keeping it, then choosing another red marble?

23. Rolling a 3 on a dice and then drawing a red card from a deck of cards.

24. You are choosing two cards from a deck. The first card is a queen, if you keep that card what is the probability that the second card is a face card?

25. Flipping a coin, and getting tails both times.